REMARKS

The Examiner is thanked for the due consideration given the application. This amendment is being filed concurrent with a Request for Continued Examination. The specification has been amended to improve the language.

Claims 22-42 remain pending in the application. Acknowledgement of the allowability of claims 25, 28-33 and 37-42 is noted with appreciation. The claims have been amended to improve the language in a non-narrowing fashion.

No new matter is believed to be added to the application by this amendment.

The Specification

The specification has been objected to as not correctly spelling "Fourier". The specification has been amended to correctly spell "Fourier".

Rejections Based on HEIKKINEN

Claims 22-24 and 35 have been rejected under 35 USC §103(a) as being unpatentable over HEIKKINEN (U.S. Publication 2002/0184009) in view of SU et al. (U.S. Publication 2008/0147384).

Claims 26 and 34 have been rejected under 35 USC §103(a) as being unpatentable over HEIKKINEN in view of SU et al. and ALLES (U.S. Patent 4,201,105).

Claim 27 has been rejected under 35 USC §103(a) as being unpatentable over HEIKKINEN in view of SU et al. and THYSSEN et al. (U.S. Patent 6,240,386).

Claim 36 has been rejected under 35 USC §103(a) as being unpatentable over HEIKKINEN in view of SU et al. and ALLES, and further in view of THYSSEN et al.

These rejections are respectfully traversed.

The present invention pertains to differentiated digital processing of a sound signal that includes application to the temporal signal of the inverse variation of the pitch. The validation of the pitch in the frequency domain improves the accuracy of pitch determined by calculating the period of the fundamental.

The present invention is illustrated by way of example, in Figure 2 of the application, which is reproduced below.

FIG.2
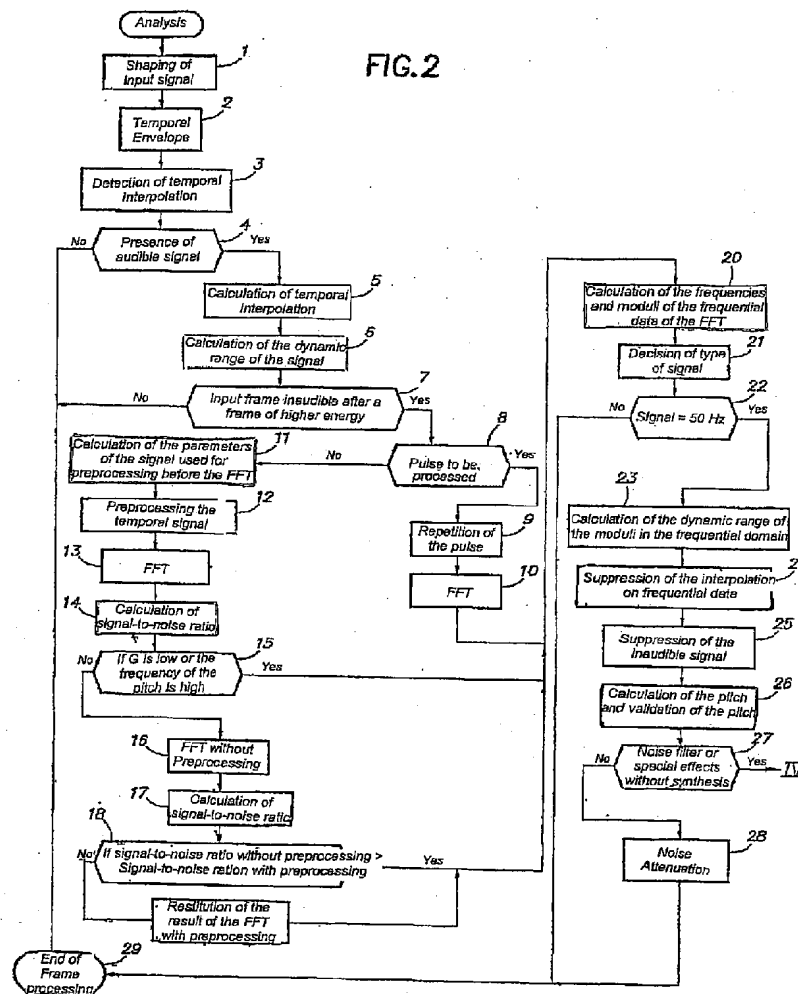
The process schema in Figure 2 is reflected in instant claim 22, for example, which states:

A method for a differentiated digital processing of a sound signal, constituted in an interval of a frame by a sum of sines of fixed amplitude and of which a frequency is modulated linearly as a function of time, this sum being modulated temporally by an envelope, a noise of said sound signal being added to said signal, prior to said sum, comprising:

a stage of analyzing making it possible to determine parameters representing said sound signal by

 calculating the envelope of the signal,

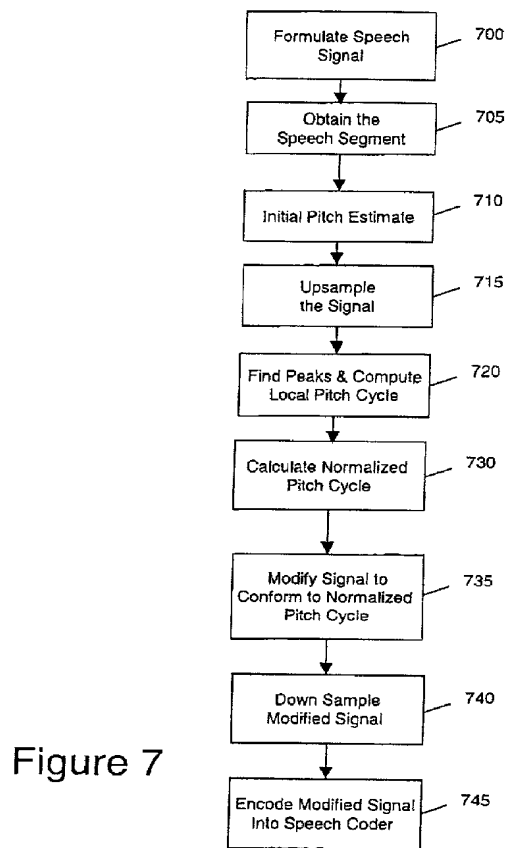 *calculating the sound signal of the pitch and its variation,*

 applying to a temporal signal of an inverse variation of the pitch a temporal sampling of the sound signal with a variable sampling step, this step varying with an inverse value of the pitch variation,

 performing a Fast Fourier Transformation (FFT) of a pre-processed signal,

 extracting signal frequential components and their amplitudes from a result of the Fast Fourier Transformation, and

 calculating the pitch in a frequential domain and its variation with respect to the previously calculated pitch in order to improve a precision of the previously calculated pitch.

HEIKKINEN pertains to improving voicing determination in speech signals containing high levels of jitter. The process schema of HEIKKINEN is illustrated in Figure 7 of the reference, which is reproduced below.

```
┌──────────────────┐
│ Formulate Speech │        700
│      Signal      │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│   Obtain the     │        705
│  Speech Segment  │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│ Initial Pitch    │        710
│     Estimate     │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│    Upsample      │        715
│   the Signal     │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│ Find Peaks & Compute │    720
│  Local Pitch Cycle   │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│ Calculate Normalized │    730
│    Pitch Cycle       │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│  Modify Signal to│       735
│Conform to Normalized │
│   Pitch Cycle    │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│   Down Sample    │       740
│  Modified Signal │
└──────────────────┘
        │
        ▼
┌──────────────────┐
│Encode Modified Signal│   745
│  Into Speech Coder   │
└──────────────────┘
```

Figure 7

The Office has admitted that HEIKKINEN does not disclose that *"applying to a temporal signal of an inverse variation of the pitch a temporal sampling of the sound signal with a variable sampling step, this step varying with an inverse value of the pitch variation."*

In comparison, paragraph 0050 of HEIKKINEN concerns a Linear Predictive (LP) Coding:

> *"In LP coding analysis it is assumed that the current speech sample can approximately be predicted by a linear combination of the past samples and corresponding transfer function is often called an LP synthesis filter. The inverse of the synthesis filter is called analysis filter and the prediction error*

25

signal which is obtained by subtracting the predicted signal from the original signal, is called residual signal. In the ideal predictor the spectrum of the residual signal is flat."

Paragraph 0050 of HEIKKINEN does not disclose or infer the features of the instant claims 22 and 34 of the present invention.

However, the Office Action considers that HEIKKINEN discloses that *"applying to a temporal signal of an inverse variation of the pitch (inverse; paragraph 0050)"*. As mentioned before, paragraph 0050 concerns a Linear Predictive (LP) Coding. Paragraph 0050 only states that *"The inverse of the synthesis filter is called analysis filter"*. For one of ordinary skill in the art, it is clear that the inverse as mentioned in paragraph 0050 is not identical to the inverse variation of the pitch as defined in the present claim 22.

SU et al. describe in paragraphs 43-45 also a Linear Predictive (LP) Coding (see paragraph 0043) as described in HEIKKINEN. SU et al. describe a pitch estimator which determines a pitch lag value and a pitch gain coefficient for voiced segments of the input speech. The pitch lag may be estimated based on the weighted speech signal or may be expressed as a pitch frequency in the frequency domain. The pitch estimator provides the estimated representative pitch lag to an adaptive codebook (see paragraph 0045).

The Office Action has cited paragraphs 69-80:

According to SU et al., *"The inputted speech signal is modeled as a series of segments of pitch lag versus time…"*. A segment may be shifted in time with respect to the other segments to produce a more uniform pitch consistent with an estimated pitch track. Discontinuities between the shifted segments and the subject segment are avoided by using:

- interpolation or averaging may be used to join the edges of adjacent segments

- continuous time-warping of perceptually weighted speech signal as the input speech signal (paragraphs 0070, 0077 and 0078)

Paragraph 0072 of SU et al. indicates that an application of a predictive coding (LPC) procedure to the inputted speech signal or weighted speech signal that is not generally voiced or not generally stationary.

"The predictive coding includes the determination of the appropriate excitation vectors from the adaptive codebook 36 and the fixed codebook 50." (paragraph 0073)

Applicants have found no sentence that discloses or infers the features of *"applying to a temporal signal of an inverse variation of the pitch a temporal sampling of the sound signal with a variable sampling step, this step varying with an inverse value of the pitch variation"* as defined in the instant claims 22 and 34 of the present invention.

The combination of HEIKKINEN and SU et al. thus does not lead to the features of the instant claims 22 and 34.

The use of time-warping algorithm as described in HEIKKINEN and SU et al. may produce artefacts that imply more processing stages to overcome said drawback. This is time and cost consuming.

The other applied art references of ALLES and THYSSEN et al. do not address the deficiencies of HEIKKINEN and SU et al. discussed above.

HEIKKINEN thus does not anticipate a claimed embodiment of the present invention. One of ordinary skill and creativity would not produce a claimed embodiment of the present invention from a knowledge of HEIKKINEN and the secondary references, and a *prima facie* case of unpatentability has thus not been made.

These rejections are believed to be overcome, and withdrawal thereof is respectfully requested.

Conclusion

Prior art of record but not utilized is believed to be non-pertinent to the instant claims.

It is believed that the objections and rejections have been overcome, obviated or rendered moot, and that no issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON

/Robert E. Goozner/
Robert E. Goozner, Reg. No. 42,593
209 Madison Street, Suite 500
Alexandria, VA 22314
Telephone (703) 521-2297
Telefax (703) 685-0573
      (703) 979-4709

REG/jr